

estimation of the real number of patients. Therefore, it is recommended that the CDC explain in detail the setting of the data collection in its periodic reports to safeguard against possible overestimation or underestimation of HIV/AIDS. This can help experts, and especially international agencies such as UNAIDS, to make more accurate estimates of HIV/AIDS. Expert judgment is needed in policy making for such important health issues and official statistics cannot always be trusted.

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## Sexual behaviour and high risk human papillomavirus infections in Japanese women

The increasing incidence of sexually transmitted infection (STI) in young people is one of the most important social and health problems in Japan,<sup>1</sup> and recent changes in the sexual behaviour may be an important factor.<sup>2</sup> Cervical human papillomavirus (HPV) infection is one STI and is the major cause of cervical cancer, which is the cancer

with the second highest incidence rate and fifth highest cause of cancer death in women worldwide.<sup>3</sup> Japan is an area with the second lowest incidence of cervical cancer worldwide.<sup>3</sup>

To investigate the prevalence of STIs, we performed a cross sectional study of women attending gynaecology departments in the Hokuriku area of Japan from July 2000 to July 2003. In all, 797 women between 15 and 62 years old were selected from about 15 000 women who had visited and had a cervical cytology test in one of five clinics during this period. After obtaining written informed consent, all the subjects were given to pelvic examinations, a cervical cytology test, and an STI test using the cervical scraped cell samples. DNA for high risk HPV (HPV types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, and 68), *Chlamydia trachomatis*, and *Neisseria gonorrhoeae* was detected using hybrid capture assays (Digene, USA) performed at the Mitsubishi Kagaku Clinical Laboratory in Tokyo (Japan). To document each subject's occupation and sexual behaviour, they were given a questionnaire that they completed independently and returned in a sealed envelope. The questionnaires and clinical data were sent directly to the research centre at Kanazawa University. All of the subjects had the right to refuse to answer any question. Out of 797 subjects, 16 were not eligible owing to lack of information or refusal to complete the questionnaire, and finally 781 women were evaluated in this study.

The age of the eligible subjects was 15–59 years: mean age (SD) 29.0 (8.1). The proportion of women who had had sex before the age of 16 years was 21% (160), while 23% of the women had had more than one sexual partner in the previous year (180). Seventy five women (9.6%) were currently pregnant and 130 women (17%) had undergone an abortion in the past. Of the subjects, 344 women had some symptoms (44%) suggestive of genital infections, such as vulvovaginal itching or soreness, increased or abnormally coloured vaginal discharge, and lower abdominal pain, and the remaining 437 women had no such symptoms (56%). Overall, the prevalence of high risk HPV, *C trachomatis*, and *N gonorrhoeae* was 24%, 5.9%, and 2.2%, respectively. The prevalence of high risk HPV was 50% in women aged 15–19 years, and 37% in women aged 20–24 years (fig 1). The prevalence decreased with age (Kruskal-Wallis test:  $p < 0.05$ ). The prevalence of high risk HPV infection was 17% (107/637) in women with normal cytology, 38% (27/72) in those with atypical squamous cells of undetermined significance (ASCUS), 72% (42/58) in those with low grade squamous intraepithelial lesion (LSIL), and 86% (12/14) in those with high grade squamous intraepithelial lesion (HSIL).

A univariate analysis showed that the risk factors for high risk HPV infection were younger age (15–24 years), unmarried, current smoker, alcohol intake, histories of STD, younger age (12–19 years old) at first sexual intercourse, more than six lifetime sexual partners, frequent sexual intercourse (more than twice/week), current STD in partner, and worried that she might have an STD, while the factors decreasing the risk were history of pregnancy and condom use on all occasions (table 1). By contrast, present clinical symptoms, history of abortion, and current pregnancy were not associated with high risk HPV infections (data not shown). A multivariate analysis using an unconditional logistic

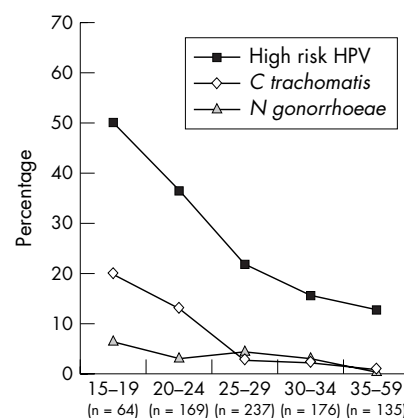


Figure 1 The prevalence of cervical infections according to ages of Japanese women.

regression model revealed that, after controlling for all other variables, being single, a history of STD, thinking she might have an STD, and increased numbers of sexual partners were associated with high risk HPV infection. Evidence for association with younger age at first intercourse, more frequent intercourse and frequent condom use were attenuated. There was no evidence of an association with age, smoking, alcohol intake, history of pregnancy and STD in the partner.

The prevalence of cervical high risk HPV infection in 15–19 year old women in this study was similar to that in Japanese commercial sex workers (CSWs) (48.4%, mean age 29 years).<sup>4</sup> Although we have also no way of knowing whether part-time CSWs were included among these subjects, self reporting indicated that there were no professional sex workers. In a previous study of women participating in a cancer screening programme, we found that the prevalence of high risk HPV in women with normal smears (age 16–72 years, mean age 37.0 (SD 13.5) years) was 9.7%, compared with 19% in this study.<sup>5</sup> Women selected to be in this study were, however, younger and probably at higher risk of HPV infection, since 44% had symptoms suggestive of genital infection. The findings suggest that many young Japanese women who are not professional CSW are infected with high risk HPV.

Many studies in other countries have shown that the risk factors for HPV infection are younger age at first sexual intercourse,<sup>6</sup> a high number of lifetime sexual partners,<sup>6–8</sup> a high frequency of vaginal sex,<sup>7</sup> unmarried women,<sup>8</sup> having anal sex,<sup>7</sup> having a highly sexually active main partner,<sup>7,9</sup> and alcohol

## Key message

- This is a first epidemiological study demonstrating high prevalence of cervical high risk HPV infection in Japanese women who are not commercial sex workers
- This clarifies independent risk factors associated with high risk HPV infection in Japan using a multivariate analysis
- A nationwide STD education and prevention programme should be implemented in Japan

**Table 1** Clinical and demographic factors associated with cervical high risk HPV infections in Japan

Variables	Prevalence			Univariate analysis		Multivariate analysis		Wald test
	Total No	Positive No	%	Crude OR	95% CI	Adjusted OR*	95% CI	p Value
Age (years)								
45–59	50	8	16%	1	Reference	1	Reference	0.42
15–24	233	94	40%	2.5	(1.3 to 4.8)	1.1	(0.43 to 3.0)	
25–34	413	78	19%	1.2	(0.61 to 2.3)	0.85	(0.35 to 2.1)	
35–44	85	9	11%	0.66	(0.27 to 1.6)	0.60	(0.20 to 1.8)	
Marriage status								
Married	440	66	15%	1	Reference	1	Reference	0.023
Unmarried	341	123	36%	2.4	(1.8 to 3.1)	1.7	(1.1 to 2.6)	
Current smoking								
no	562	112	20%	1	Reference	1	Reference	0.45
yes	219	77	35%	1.8	(1.4 to 2.3)	1.2	(0.77 to 1.8)	
Alcohol intake								
no	631	144	23%	1	Reference	1	Reference	0.58
1–4 days/week	119	37	31%	1.4	(1.01 to 1.8)	1.3	(0.78 to 2.0)	
>4 days/week	31	8	26%	1.1	(0.61 to 2.1)	0.85	(0.31 to 2.3)	
Past history of pregnancy								
no	312	97	31%	1	Reference	1	Reference	0.22
yes	469	92	20%	0.63	(0.49 to 0.81)	0.76	(0.50 to 1.2)	
Past history of STD								
no	748	170	23%	1	Reference	1	Reference	0.0083
yes	33	19	58%	2.5	(1.8 to 3.5)	2.9	(1.3 to 6.4)	
Current STD in her partner								
no	731	167	23%	1	Reference	1	Reference	0.75
yes	50	22	44%	1.9	(1.4 to 2.7)	0.88	(0.41 to 1.9)	
Worried that she might have STD								
no	681	144	21%	1	Reference	1	Reference	0.017
yes	100	45	45%	2.1	(1.6 to 2.8)	2.0	(1.1 to 3.7)	
Age at first sexual intercourse (years)								
20–40	259	36	14%	1	Reference	1	Reference	0.069
12–16	160	66	41%	3	(2.1 to 4.2)	2.0	(1.1 to 3.6)	
17–19	362	87	24%	1.7	(1.2 to 2.5)	1.2	(0.77 to 2.0)	
Frequency of sexual intercourse in a week								
0–1 day	660	138	21%	1	Reference	1	Reference	0.057
2–3 days	86	34	40%	1.9	(1.4 to 2.6)	1.9	(1.1 to 3.1)	
more than 4 days	35	17	49%	2.3	(1.6 to 3.4)	1.4	(0.66 to 3.1)	
No of lifetime sexual partners								
0–5	538	98	18%	1	Reference	1	Reference	0.020
6–19	199	67	34%	1.8	(1.4 to 2.4)	1.3	(0.84 to 2.0)	
more than 20	44	24	55%	3.0	(2.2 to 4.1)	2.8	(1.4 to 5.8)	
Frequency of condom use								
never or occasionally	579	150	26%	1	Reference	1	Reference	0.145
usually	81	20	25%	0.95	(0.64 to 1.4)	0.77	(0.42 to 1.4)	
at all occasions	121	19	16%	0.61	(0.39 to 0.94)	0.58	(0.33 to 1.0)	

\*Adjusted OR: the odd ratio, which was adjusted with other all variables.

intake.<sup>7</sup> In our study, unmarried women, younger age at first sexual intercourse, a high number of lifetime sexual partners, and frequent sex increased the risk of high risk HPV infection. As found in previous studies, Japanese women who practise unsafe sex are at high risk for cervical HPV infection. A unique factor in our study was that a subject who was concerned that she might have an STD was more likely to have an HPV infection. Since current STD in their partner and the presence of clinical symptoms were not associated with HPV infection, unexplained discomfort or recent experience of risky sexual behaviour might be involved. Clinicians should be aware that women who feel that they might have an STD are at high risk for genital HPV infection.

Our study clearly demonstrated that frequent sexual contact with multiple partners at a younger age is likely to be a significant risk factor for high risk HPV infection. A nationwide education and prevention program concerning STD is urgently needed in Japan. Although not all women with high risk HPV develop cervical cancer,<sup>10,11</sup> a percentage of the women with cervical high risk HPV infection do develop cervical cancer decades later. Therefore, the incidence of cervical cancer in

younger women might increase with the increase in cervical HPV infection in Japan, as reported in many developed countries.<sup>3</sup> Regular participation in a cervical cancer screening program starting at 20–25 years of age or from 3 years after the onset of vaginal intercourse is recommended.

### Contributors

TS planned this study, collected clinical samples and information, performed statistical analyses, and wrote this paper; MT, HY, and KAK recorded all data, summarised results, and performed statistical analyses; TF, TTU, TN, SS, and HY collected clinical samples and provided information about clinical data and sexual behaviour of subjects; AS and MI organised the study project and collected some samples.

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## CORRECTION

The paper by S Hawkes and K G Santhya in the April 2002 issue (Diverse realities: sexually transmitted infections and HIV in India. *Sex Transm Inf* 2002;**78**:i31–i39) cited the first author of reference 71 to be Mali JJ-B. That is incorrect, the first author is JV Joshi JV.

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